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Development of Cluster Computing –A Review

Fahad Ahmad Shahid Naseem Qura-Tul-Ain Khan Dr. M. Saleem Khan

Abstract
This paper presents the review work of "Cluster Computing" in depth and detail. Cluster Computing: A Mobile Code Approach by R.B.Patel and Manpreet Singh (2006); Performance Evaluation of Parallel Applications Using Message Passing Interface In Network of Workstations Of Different Computing Powers by Rajkumar Sharma, Priyesh Kanungo and Manohar Chandwani (2011); On the Performance of MPI-OpenMP on a 12 nodes Multi-core Cluster by Abdelgadir Tageldin, Al-Sakib Khan Pathan , Mohiuddin Ahmed (2011); Dynamic Load Balancing in Parallel Processing on Non-Homogeneous Clusters by Armando E. De Giusti, Marcelo R. Naiouf, Laura C. De Giusti, Franco Chichizola (2005); Performance Evaluation of Computation Intensive Tasks in Grid by P.Raghu, K. Sriram (2011); Automatic Distribution of Vision-Tasks on Computing Clusters by Thomas Muller, Binh An Tran and Alois Knoll (2011); Terminology And Taxonomy Parallel Computing Architecture by Amardeep Singh, Satinder Pal Singh, Vandana, Sukhnandan Kaur (2011); Research of Distributed Algorithm based on Parallel Computer Cluster System by Xu He-li, Liu Yan (2010); Cluster Computing Using Orders Based Transparent Parallelizing by Vitaliy D. Pavlenko, Victor V. Burdejnyj (2007) and VCE: A New Personated Virtual Cluster Engine for Cluster Computing by Mohsen Sharifi, Masoud Hassani, Ehsan Mousavi Khaneghah, Seyedeh Leili Mirtaheri (2008).
Keywords:Cluster computing, Cluster Architectures, Dynamic and Static Load Balancing, Distributed Systems, Homogeneous and Non-Homogeneous Processors, Multicore clusters, Parallel computing, Parallel Computer Vision, Task parallelism, Terminology and taxonomy, Virtualization, Virtual Cluster.

1 Introduction

It is a review of papers taken since 2005 to 2011 during this time an extensible work has done in cluster computing and issues related to this field. Following work on cluster computing was done by different authors using different techniques and tools.

In this paper, the author has discussed the Cluster Computing by using Mobile Code Approach. The researcher mentions that in Parallel Computing, "Cluster computing" technique is a powerful tool for computing in case of large amount of data. He has offered a scheme and application of a cluster centered structure by using mobile code. The cluster application includes the scheme of a server named as MCLUSTER which manages the configuring, resetting of cluster. This structure generate the application mobile code and then distribute to the appropriate client nodes, active handling of results gathered and communicated by client nodes and recording of processing time of program. The mobile code received and processed by client node this distributed job is allotted by MCLUSTER and then sends back the results. He has also examined the performance of the established system stressing the communication and computation overhead. [1]

In this paper, the author has discussed that a network developed by ordinary hardware can efficiently use for intensive computing. By uniting processing powers of many dispersed workstations, an intensive computational task can be solved in short time limit, which is comparable to that the committed parallel computer. Generally these systems are named as Cluster or Network of Workstations (NOWs). He examines effects on execution time after running parallel application on selected favorable nodes, in terms of computing power and compares it with performance of application executed on different nodes. Distributed computing system consists of processors all connected through a communication network, each processor has its own native memory and other peripherals and communicated through **message passing** technique in the communication network. The processors of distributed computing systems (loosely coupled) can be geographically distributed to cover a wider area in contrast to the parallel systems (tightly coupled). [2]

In this paper, the author has discussed that growth in the number of Quad-Core-based clusters and the computing nodes with large shared memory used by multiple cores, different issues relevant to scalability reveal. He also examines the consequences of a cluster having a dual Quad-Core Processor on each node. Some consequences are stated by using these processors on a benchmark test. A Quad-Core-based cluster's complexity rises when both local and network communications among the processes need to be communicate. The abilities of MPI-OpenMP approach are identified because of reduced communication overhead. [3]

In this paper, the author examines the dynamic and static balancing of cluster which is non-homogenous, concurrently examining the hypothetical parallel Speedup and the Speedup practically attained. Three interconnected clusters have been gathered and the machines have same processors within each cluster but different among clusters. Hence it is a heterogeneous cluster. An implementation of Parallel N-Queens using a parallel solution algorithm, in which processing prevails on communication, has been selected in

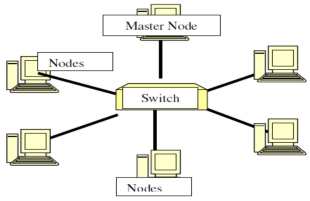
order to examine the load balancing aspects deeply to get rid of bias produced by communication overhead. Simultaneously, three types of load distribution in the processors are Direct Static, Predictive Static and Dynamic demand, also parallel Speedup and load unbalancing about problem size and the processors used in each case have been examined. [4]

In this paper, the author discussed that the Grid computing is an unusual type of parallel computing, in which we combine servers, storage systems, and networks into a single large virtual super computer. Grid computing includes the benefits of solving complex problems in a smaller time and also makes well use of the existing hardware. It gives the benefits by using free resources to meet business requirements and also minimizing additional costs. There are many Grid setup tools exist. [5]

In this paper, the author proposed a consistent and proficient but yet convenient system for parallel computer vision, and in fact also real time actuator control. The system implements the multi-agent paradigm and blackboard information storage. This, blackboard in combination with a generic interface for hardware abstraction and integration of external software components, is setup on basis of the message passing interface (MPI). The system allows for data-parallel and task-parallel processing, and supports both synchronous communications, as data exchange can be triggered by events, and asynchronous communication, as data can be polled, techniques. Also, by replication of processing units (agents) redundant processing is possible to gain greater strength. As the system automatically divides the task units to available resources, and a checking concept allows for combination of tasks and their composition to complex processes, it is easy to develop efficient parallel vision, robotics applications quickly. [6]

In this paper, the author said that due to the increase in data size, the level of computation is going on to increase. Hence we are trying to bright the Parallel Computing Architecture Terminology and Taxonomy. This paper also emphasis on architecture of parallel computing. In parallel many calculations are done simultaneously parallel computing has become the leading model in computer architecture used in the form of multicore processors. In parallel computing a task is divided into distinct parts that are processed simultaneously. Each part is again broken down and then each part execute concurrently on different CPUs. [7]
In this paper, the author described that Parallel computer cluster technology is an important expansion of high-performance parallel computer system. Parallel computer system is the best choice in organization, which requires high frequent operations. This paper gives the ideal scheme has discussed based on the analysis of the complex degree of common distributed algorithm, and mention the advantages of distributed algorithm useful in the high-performance parallel computer system. The variation of parallel computer system structure growth is very fast, which generally embodies in two aspects. One is the expansion of performance in calculating node, and the other is the development of communications technology between nodes. Cluster systems can be distributed into four parts : Management node, the node, network and software of cluster management. Cluster system has the virtue of high scalability, high performance, high cost efficiency and high availability etc. [8]

In this paper, the author suggests an innovative tactic to parallel applications growth, with high speed and low labor intensiveness of producing new parallel applications and to make parallelize existing applications. The promising tactics of employment of these principles are anticipated. Usage of the technology with a sample algorithm is displayed. The result of experiment is given to show high productivity of anticipated technology. [9]
In this paper, the author mentioned that, Virtualization communicates the problem for making competent use of existing computer sources. Currently, an experiment held to virtualize a single physical cluster into multiple autonomous virtual clusters to deliver a greatly scalable and available virtual server constructed on a cluster of real servers. Programs built for a cluster found diverse requirements as their executions proceeds, like compatibility for rigorous processing, security, and huge data communications, hence it is very difficult for a statically configured cluster with fixed number of nodes and features to do good for these applications. This paper reveals a new aspect of virtualization with the background of distributed computing by using virtual clusters, named Virtual Cluster Engine (VCE) which creates a computing environment that helps both statistically and dynamically reorganized clusters according to the needs of applications. [10]



2 Structural Discussion and Analysis

1. R.B.Patel, & Singh, M. (2006). Cluster Computing: A Mobile Code Approach. Journal of Computer Science, 9.

In a usual cluster, Master node is used to run the application. However, the computational work is divided and distributed among the node which is done by the multiple nodes in the cluster. The chief units for building a cluster are: System Administration, Hardware Supervision and Software Platform Maintenance. The framework consists of Personal Computers, high speed communication network and distributed applications. Java middleware is used in cluster in order to provide the Single System Image of the cluster to any computer with

changed OS platforms when the Java virtual machine is installed. Then JVM performs implementation, migration and execution of the mobile code at destination computer in cluster. The structure has been planned in a way that incremental variations in it can improve the generality and usability of cluster. Computers in a cluster are committed to a network to get their collective processing power for running parallel-processing applications. Three forms of Cluster are High-availability (HA) clusters are used for filtering the availability of services. Load balancing clusters run by taking all load arise from one or more load-balancing front ends that divides it to the group of back end servers. Performance of application is a function of problem size, network parameters and cluster size. The settled MCLUSTER model focuses on reducing the communication overhead by using the mobility of code.

2. **Sharma, R., Kanungo, P., & Chandwani, M. (2011). Performance Evaluation of Parallel Applications Using Message Passing Interface in Network of Workstations Of Different Computing Powers. Indian Journal of Computer Science and Engineering, 4.**

In parallel systems, the processors are usually small in number and limited by shared memory bandwidth. Whereas, distributed computing systems can be expanded and have nearly limitless number of processors. In NOWs, among the processors a parallel application is executed by distributing processing tasks. The processing tasks are assigned to processors randomly without seeing the computing capacity of individual workstations. The workstation's hardware factors like clock speed of processor, cache memory, primary memory; hard drive volume and RPM give variation in execution time of application. He has conducted tests on a cluster of eight nodes with different computing power, connected with an Ethernet 10/100 IEEE 802.3 switch. In order to execute parallel application on cluster, a Message Passing Interface Library is required to begin point-to-point and combined communication among the processors. He solved the problem of numerical integration by 'Trapezoidal Rule of Integration' by running parallel program on the cluster. Different groups of five nodes out of eight nodes are formed to compare the performance of each group. Some groups consist of nodes having more computing power than all other nodes and some groups consist of nodes having less computing power than all other nodes. A combination of both types (more powerful and less powerful) of nodes is kept in remaining groups. Parallel program for Trapezoidal Rule many times on each group separately and find the mean execution time. Observation indicates that the execution time is decreasing for the groups with the nodes having higher computing powers.

Execution time for different groups

Group Id.	G 1	G 2	G 3	G4	G 5	G 6
Execution Time (ms)	374	352	339	304	287	260

3. **Abdelgadi, A. T., Pathan, A.-S. K., & Ahmed, M. (2011). On the Performance of MPI-OpenMP on a 12 nodes Multi-core Cluster. 11.**

An MPI-OpenMP is an important technique in optimizing local communications between processors in a multi-core cluster and it can be used in such clusters which boost network communications between nodes. The workload has been divided among the group of typical cores into a single "Processor". Here HPL has used as scale to measures the performance of a node and eventually, measures the performance of a cluster by pretending imitation of mathematical applications. The most important measure is *Rmax*, which is measured in Gigaflops that denotes the maximum performance of a system. The cluster comprises of 12 Compute Nodes with a Master Node. Only compute nodes were tested because the Master node was changed in capacity and speed. Tests have done in two ways, in first iteration a single node performance was measured and then in second iteration the performance of the cluster would measure. Different patterns were applied in each of the iterations, like the changing of the grid topology which is used by HPL according to different settings. The test was done for a single node and then for all nodes. It is a safety measure to check whether all nodes are working as estimated as the cluster's performance in an HPL. It is often assumed that in a cluster-wide test, achievement of high performance is related to frequency of the processor and the number of cores being installed on each node. Different cores complete the same procedure in parallel; this gives great network communication between the different nodes in clusters. Furthermore, processing speed inclines to be faster than the Gigabit communication link available for the cluster. The foremost weakness in test-run phases is MPI processes produce massive data, which needs lots of network bandwidth. MPI library was presented in next test-runs. The addition of the choice tends to an execution conscious of communication types existing for this cluster and the shared memory communication inside a node's cores. This tends to the achievement of improved performance. The outcomes specify that drastic performance gained by altering the way we face with current computer clusters.

4. **Giusti, A., Naiouf, M., Chichizola, F., & De Giusti, L. (2005). Dynamic Load Balancing in Parallel Processing on Non-Homogeneous Clusters. JCS&T, 7**.

Cluster can be homogeneous or heterogeneous with respect to the machines that used. This is a vital factor for the examination of performance which can be gained from a cluster as a parallel machine. A multi-cluster architecture is constructed by joining two or more clusters to design a new parallel machine. The representation of international performance factors of a multi-cluster is complex, like the number of dominant clusters, the degree of heterogeneity of processors and the communication between the clusters. Though the processing can be simplified resorting to a "super-cluster" with a processor with an interconnected cluster, the communication model is still difficult and even inter-cluster communication can have a fixed bandwidth.

The use of a Master-Slave pattern with Multi cluster building offers at least two options: If a single Master M processor out of one cluster is used, both its performance and the communication time from any other multi-cluster node need to be categorized. If a Master M_i processor from each cluster is used, a communication model for M_i should be described. The load balancing of an application has a straight effect on the attained speedup like in the performance of the parallel system. There are many data parallelism problems for which a static balancing allocation of the total workload is performed. Here is a heterogeneous architecture and is possible to define a predictive F (P_i, W_t) function. In variable workload case due to the data particular characteristics, it is not promising to have a predictive function that guarantees load balancing among processors. So, dynamic allocation policy is necessary. Any dynamic allocation plan used recommends some overhead communication degree, which will be more complex. In a heterogeneous architecture machines with different clusters can be compared to a calculation power function of the machines. Besides, it has been chosen to work with the Master- Slave pattern in which communication time among processes is not significant, then processing time (Tp > Tc). This condition lets to find the variances among the static and dynamic load balancing patterns. Three ways of data parallelism implementation will be used:, Predictive Static Distribution (PSD), Direct Static Distribution (DSD and Dynamic Distribution upon Demand (DDD).The experimental measuring of the actual Speedup should directly correlate with the balancing achieved degree with the total work allocation during the execution of the application.

5. **Raghu, P., & Sriram, K. (2011). Performance Evaluation of Computation Intensive Tasks in Grid. 5.**

Computing is emerging in distributed and single users or client applications and gaining access to computing means like storage, processors or data as needed. The user has little or even no knowledge that where the means are located and what is the basic technology, hardware and OS used. Grid is a setup, which permits integrated, joint use of geographically separated, autonomous resources. Grid computing is simply linking together of multiple computing resources, including processors and storage devices, to produce a much larger, more powerful single virtual computer. As the Internet allow users to share ideas and files. Grid computing has the ability for computers to communicate a step further. The network of computers may consist of several computers in a single location, or it may consist of hundreds or thousands of computers joining different geographic sites. In grid applications are running, and a part of software called "middleware" chooses which definite machine in grid will execute the application. This determination is based on the software and hardware requirements of the application made at run time and the availability of the computers in the grid. Grid computing offers different benefits, like: making individual applications run much faster, increasing the use of all available computing resources, allowing multiple applications to share computing resources and providing elasticity to add more resources to the grid as required, increasing output by providing users the resources they need on demand, using available resources more efficiently, replying quickly to changings and demands, enabling association among detached entities and creating virtual organizations. Based on their performance results, certain parameters can be derived. The work is to be extended on choosing an optimal scheduling and load balancing techniques.

6. **Muller , T., An Tran , B., & Knoll, A. (2011). Automatic Distribution of Vision-Tasks on Computing Clusters. 10.**

Distribution of computer vision tasks in parallel environments is essential considering the increasing demand for computational resources to accomplish advanced visual processing tasks. While recent industrial approaches primarily focus embedded solutions, namely advanced parallel visual processing on DSP and / or processors with embedded image processing units are developed, this paper shows a diverse solution and an implemented pattern for limp object recognition and robotic handling. The vision is an obvious dynamic distributed system sharing the image processing load on whatever hardware setup available in the current situation. Think of a mobile device with an embedded camera like smart phone on which the user wants to make complex visual processing. Processes like monocular 3D reconstruction or visual tracking surely increase the capacity of such light weight devices. Hence the aim would be to only trigger computation on a user device and perform the real

computation on powerful remote devices. Another state within mobile robotics is clear: the robots here need to be as light as possible without power-consuming electronic devices. The de facto standard for HPC environments delivers support for cluster computation on a large variation of platforms. The system automatically distributes the agents to available resources. Intellectual architectures initiate from psychology and try to integrate all findings from intellectual sciences into a general computational framework. Multiple systems have been suggested to satisfy this necessity, including Act-R12 and Soar.3.Although these techniques may be biologically credible and have the potential to provide the foundation of some applications in reality. The principle theory considering blackboard architectures is based on the supposition, that a common database of knowledge, named blackboard is filled with such by a group of professionals. There is no way for concurrent data access in parallel setups. There is no means for training an expert over time, e.g., applying machine learning techniques. A multi-agent system (MAS) is a system composed of a group of agents. Most existing implementations (e.g., JADE7) use a communication paradigm based on FIPA's agent communication language, which is designed to exchange text messages.

7. **Singh, A., Pal Singh, S., Vandana, & Kaur, S. (2011). Terminology And Taxonomy Parallel Computing Architecture. Asian Journal Of Computer Science And Information Technology, 3**.

The organization of parallel tasks is often linked with communications in real time. It is often employed by creating a synchronization point with application where a job may not continue more until another task reaches. **Vector:** A vector processor implements an instruction set comprising instructions that run on one-dimensional arrays of data called vectors. This is in contrast to a scalar processor, whose instructions run on single data items. **SIMD:** All processing units execute the same Instruction at any given clock cycle on Multiple Data. **Systolic:** A systolic array is a pipe network organization of processing units called cell. It is a particular form of parallel computing, where processor compute data and store it independently of each other. **MIMD:** Every processor may be executing a different instruction stream. Shared memory commonly has the aptitude for all processors to access all memory. **TERMINOLOGY AND TAXONOMY:** Taxonomy is the science of classification according to a pre-determined system, with the resulting collection used to provide a theoretical framework for discussion, analysis, or information retrieval. **Flynn's Classical Taxonomy**: Flynn's taxonomy differentiates multi-processor computer buildings according to how they can be categorized along the two independent scopes of Instruction and Data. Each of these dimensions can have only one of two possible states: Single or Multiple like **(SISD), (SIMD), (MISD), and (MIMD).**

8. **He-li, X., & Yan, L. (2010). Research of Distributed Algorithm based on Parallel Computer Cluster System. International conference on Computer Science and Computational Technology, (p. 4). Jiaozuo.**

Distributed algorithm is sharing information mutually in two or more software. This software runs on several computers which are connected through internet. Distributed algorithm used to solve into many small tasks and then put these tasks into a number of computers to execute. Lastly, put these calculations together to get the ultimate result. Consequently, a process supports to parallel to improve the system's computing power of the cluster. The distributed computing and the parallel computing are different but relevant. The aim of the parallel computing is to solve the single problem by using the multi-processor. However, the aim of the distributed computing is provide the ease, usability, reliable and physical distribution. Parallel computing takes attention of the short execution time, but the distributed computing emphases on the normal operation time. Cluster computing system involved different systems architecture. For some users, cluster system is a multiprocessor collection which closes integration and work together to solve a single problem. To other users, cluster system might mean a computer network which consists by the separate processor. Although the computing capabilities of high performance parallel system have increased, the rapid development of science and technology require more computing ability. There are three ways to improve the computing performance. The first is improved the device operation speed. The second is improved system structure. The third is focus on the computing ability to important area by using computational algorithm. Distributed algorithm is a parallelism algorithm based on MIMD asynchronous communication model. The only way of interaction in network is processor and its neighbors to exchange information. In fact, distributed and parallel is inseparable. In parallel machine, the processor itself is decentralized also. In distributed systems, the software's execution cannot leave the synchronization.

9. **Pavlenko, V., & Burdejnyj, V. (2007). Cluster Computing Using Orders Based Transparent Parallelizing. 12.**

Parallel computing is the subject of a lot of researches nowadays. It is due to large amount of problems that cannot be solved fast enough on single modern computers. Current parallel designs can be divided into three large groups – parallel computers with shared memory, clusters and distributed systems. Each group has own

advantages and disadvantages and own certain problems. One of not completely solved problems of parallel computing is the problem of development of tools for parallel programming. The second way is also much more popular nowadays for instance, MPI technology, which is a de facto standard used for communication among the processes for clusters. It gives programmer more control over the efficiency of created programs but makes parallel application development and debugging much harder. This paper proposes a new technology which is parallel applications development, based on transparent replacement of calls of some methods with their execution on other computers of cluster.

10. Sharifi, M., Hassani, M., Khaneghah, E. M., & Mirtaheri, S. L. (2008). VCE: A New Personated Virtual Cluster Engine. 6.

The suggested architecture feasibility for VCE has been examined on an experimental platform by using seven real machines, VMWare ESX, VMotion, and VMWare programming kit, and a number of virtual machines. The communications bandwidth has increased among workstations as new networking technologies and protocols are employed in LANs and WANs. The major benefits of clustering are: System High Availability (HA), Natural High System Availability, operating systems, and applications, Hardware Fault Tolerance, running multiple copies of the OS and applications. Clusters have been exposed to virtualization in many ways, either to share physical clusters or to virtualize a single physical cluster into multiple liberated virtual clusters. Virtualization makes use of the resources to address the problem by putting an abstraction layer that draws real resources to virtual resources. VCE presents a different use of cluster virtualization by using virtual cluster technology. An example is to deploy a virtualizer, like Xen and VMWare on a single computer to generate a number of virtual machines interconnected by a virtual switch. Improvements in multi-processor and multi-core technology, increased capability of dynamically transferring machine state from one machine to another have attracted industry and academia to use virtual machines. Here a central Virtual Cluster Engine (VCE) running on a real cluster that can be physically scaled up on-demand either by sharing with other clusters in its accessible network, or putting more nodes into service. VCE is responsible for creating a virtual cluster for any specific mandatory concern and then mapping each node in each of these virtual clusters to a real machine. Feasibility of VCE has been studied by developing an experimental platform by using seven real machines.

3 Conclusion and future work

Authors Patel and Manpreet concluded that cluster computing emerging as an alternative for Parallel computers. By gathering the computational powers of different computers the Cluster computing can be improved in distributed applications. On the other side problem size and cluster size influence the performance of problem solving. The result of improper values of these two parameters may be network congestion where computation load will replace the communication load. The Network Congestion can be reduced by using Mobile Agent technique. In case MCLUSTER server fails the functionality of the MCLUSTER is not largely affected by using the Fault Tolerance technique and replacing MCLUSTER server on some other node in existing cluster.

Authors Rajkumar, Priyesh and Manohar concluded that the experimental results shows that the performance of a parallel application over a cluster improves, if different tasks are assigned to nodes having higher computing power rather than simply distributing tasks to random nodes. If nodes having higher computing powers are busy than tasks should be assigned to nodes in decreasing order of their computing power.

Authors Abdelgadir, Al-Sakib and Mohiuddin concluded that the results show the clear difference between the MPI-OpenMP hybrid approach and an MPI-only approach and also the way in which benchmark test is affected largely when done on Multi-core clusters. The aim of this test is to find the scalability and the reliability of the cluster. In this way many more observations were recorded that will help researchers in future working with such clusters.

Authors Giusti, Naiou, Laura and Chichizola concluded that in attaining ideal speedup the major thing is choice of data distribution among clusters. In problems with parallel solution, where Tp>Tc, the N-Queens require minimum communication among machines. The Direct Static distribution technique shows the poor calculation power of each machine for work distribution against nature inspired, algorithms that exists. This phenomenon is clear in the Load Balancing and the Speedup. The dynamic distribution approach work in a more balancing way among the machines without much affecting the final time of execution among the load calculation based algorithms.

Authors Raghu and Sriram concluded that grid computing can be used for any complex task solving, in any fields. Grid computing enables organizations to take advantage of various computing assets in different ways not previously possible. The nature of a computing grid allows organizations to take advantage of parallel processing, making many applications financially feasible as well as allowing them to complete sooner.

Authors Muller, Tran and Alois concluded that here a system for parallel visual processing of

arbitrary type is presented. The system parallelizes jobs using multi-threading techniques on a single computer. Shared data access, synchronization and prevention of deadlocks are accomplished by means of the framework. Considering distributed visual processing on computing clusters, the systems deliver the basic infrastructure on the basis of the message passing interface and on-demand image streaming. Any application can be run on a single computer or a MPI ring without altering the formation. Mostly the system distributes tasks at startup using a simple process. A solution, implemented which spreads both the processors and processing units to grip information about load currently. This information will then be used to re-distribute units whenever the load exceeds some limit - the goal here is to begin a dynamic load balancing tool. However, the framework performs well, whenever the structural units are designed carefully.

Authors Amardeep, Satinder, Vandana and Sukhnandan concluded that if more efforts put on parallel computing to improve the level of parallelism. It will also improve the computing speed. Lot of work has done in this field, but still, more efforts required.

Authors Xu He-li and Liu Yan concluded that the function of parallel machine has been substituted by the distributed cluster system. Distributed algorithms and centralized algorithm have a big difference in design that is because the distributed system and centralized system have a spirit to distinguish in model. Distribution and concurrency are two basic types in distributed algorithm. Execution of distributed system constitutes some uncertainty factors. Because of these differences, the design of distributed algorithm is more complex. This may improve computer's performance and the computing power using the computation algorithm, suggested that applies distributional algorithm this perspective on the high performance parallel machine group system. To apply the distributional algorithm on the cluster system to make it synthetically systematical in order to promote the parallel computer cluster system's performance.

Authors Vitaliy and Victor concluded that, by using this approach the development of new and port existing parallel applications which are faster lower cost and efficient becomes more easy for user without changing its behavior. Proposed technique has been implemented as a framework on Java programming language. Its efficiency has been proven by solving the problem of determination of diagnostic value of formed features diagnostics on a cluster of 2, 3, 5 and 10 computers.

Authors Mohsen, Masoud, Ehsan and Mirtaheri concluded that if programs are divided and executed dynamically then higher performance of execution of programs can be achieved by VCE. The average response time shows 20% improvement on procedural running of this technique. Even with 500 nodes partitioned programs can be cost-effectively run by VCE and attain high performance. More accurate platforms depending on light-weight virtual machines, high-speed virtual networks, fast state transmission between virtual machines and significant number of nodes organization required to support this claim by considering more evidences. The requirements of programs varies on a cluster of computers at the time of executions, here a different usage for virtualization is presented in the context of distributed computing using virtual clusters, namely VCE, that offers a computing environment which can be both statistically and dynamically (re)structured according to the requirements of programs, in order to achieve best potential performance.

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